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1 June 2015

Mr. Stephen Tzhone
Task Order Monitor
U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Subject: Comments on the Draft Dioxin Reassessment Risk Evaluation of Analytical Data
from Decision Unit Sampling and Supplemental Groundwater Tracing Summary
Report
Arkwood, Inc., Superfund Site
Remedial Investigation/Feasibility Study Oversight
U.S. Environmental Protection Agency Region 6
Remedial Action Contract 2
Contract: EP-W-06-004
Task Order: 0100-RSBD-06A3

Dear Mr. Tzhone:

EA Engineering, Science, and Technology, Inc., PBC, (EA) is pleased to submit one hard copy and one electronic copy on compact disc of Comments on the Draft Dioxin Reassessment Risk Evaluation of Analytical Data from Decision Unit Sampling and the Supplemental Groundwater Tracing Summary Report. These documents were submitted to the U.S. Environmental Protection Agency (EPA) by the Potentially Responsible Party on 31 March 2015.

EA has reviewed the documents and compiled comments in the enclosed table. EA will also transmit to EPA an electronic copy of this submittal via e-mail.

If you have any questions regarding this submittal, please call me at (972) 459-5017.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Ted Telisak'.

Ted Telisak, P.E.
Project Manager

Enclosure

cc: Michael Pheeny, EPA Contracting Officer (letter only)
Rena McClurg, EPA Project Officer (letter only)
Tim Startz, EA Program Manager (letter only via e-mail)
File

Arkwood, Inc., Superfund Site
Comments on
Draft Dioxin Reassessment Risk Evaluation of Analytical Data from Decision Unit Sampling, dated 31 March 2015
and
Supplemental Groundwater Tracing Summary Report, dated March 2015

Item No.	Reference	EA Comments Dated 1 June 2015	PRP Response
1.	<p>Risk Evaluation of Analytical Data from Decision Unit (DU) Sampling</p> <p>Adjustment of the TEQ Concentration for Percent of Coarse Materials</p> <p>Page 4</p>	<p>Soil samples collected from the site contained a significant fraction of coarse soil material. Particle sizes greater than 2 mm could not be analyzed. The document notes,</p> <p><i>“The issue of the appropriate particle size for the sampling had been previously discussed in a previous U.S. EPA comment by Deana Crumbling dated October 21, 2013 on the Conceptual Site Model and Proposed Decision Unit Plan report dated August 14, 2013.”</i></p> <p>Deana’s comment only dealt with choosing a target particle size based upon the exposure pathway and not what should be done if the sample exceeds this size. The ITRC ISM guidance (http://www.itrcweb.org/ism-1/2_2_Soil_Heterogeneity_and_Variation.html) states,</p> <p><i>“Commonly, the maximum grain size considered to still qualify as part of soil is 2 mm. (Section 2.2.1)”</i></p> <p>The grain size of 2 mm is identified as a very coarse sand. From an exposure perspective, one would expect that any receptor would be exposed to the entire soil sample. However, based upon the designation of 2 mm as soil and also as a coarse sand, it does not appear appropriate to consider soil particles greater than this amount as available for exposure. The primary exposure routes for exposure to dioxin in soil is ingestion and dermal contact. One would not expect a receptor to ingest a particle greater than 2 mm. For dermal contact, it is primarily from soil that contacts and remains on the skin. Soil particles greater than 2 mm are not expected to remain on the skin for extended periods of time. As a result, the unadjusted concentrations should be used for any risk-based comparisons.</p>	

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2.	<p>Risk Evaluation of Analytical Data from Decision Unit Sampling</p> <p>Comparison to Soil Screening Levels</p> <p>Page 5</p>	<p>The risk evaluation concludes,</p> <p><i>“This indicates that, under the current exposure conditions at the site, the PCDD/F concentrations in soil at these seven Decision Units do not pose a noncancer hazard.”</i></p> <p>It is agreed that the current site use supports this conclusion and the maintenance worker scenario, which correlates to a risk-based screening level of 12,100 parts per trillion (ppt). However, when determining site protectiveness, potential site future use must also be taken into account. The current restrictions at the site are not sufficient to ensure that additional commercial/industrial uses would not occur at the site. A comparison/conclusion should also be provided for potential future use at the site which correlates to the industrial/commercial worker.</p>	
3.	<p>Risk Evaluation of Analytical Data from Decision Unit Sampling</p> <p>Comparison to Soil Screening Levels</p> <p>Page 5</p>	<p>Unadjusted TEQ concentrations were detected above the 730 ppt from DU 5 and DU 7, which are both beyond the site boundary. Additionally, unadjusted TEQ concentrations were also detected above the 730 ppt in DU 1 and DU 6, which both abut the site boundaries. As a result, it appears that dioxin contamination may have migrated beyond the site boundaries through either overland flow or past site use/dust. These areas are not owned or controlled by the PRP, and the presence of dioxin beyond the site boundaries would result in a change to the site conceptual site model.</p>	
4.	<p>Supplemental Groundwater Tracing Summary Report</p> <p>Table 8, page 15</p> <p>and</p>	<p>Table 8 indicates the peak mean flow rate of 78.48 gallons per minute (gpm) was recorded on 3 January 2015, which was 47 days after the dyes were injected. Conclusion 3 of the report states,</p> <p><i>“Based on water samples, both dyes had declined by over three orders of magnitude by the end of sampling, which occurred 7 weeks after dye introduction.”</i></p>	

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	<p>Section 3.3.2 Mass Balance Calculations, page 22</p> <p>Conclusion 3, page 24</p>	<p>Peak discharge at Little Cricket Spring is reportedly around 1,200 gpm.</p> <p>Several points can be made regarding discharge over the course of the test:</p> <ul style="list-style-type: none"> • First, the peak discharge at the end of the test was only 78.5/1200 or 6.5 percent of peak discharge of 1,200 gpm. • Three orders magnitude decline in dye concentrations were present on the day of peak discharge (day 47), so very little dye return during the peak discharge was observed. • Despite this three order of magnitude decline in concentration, a concentration increase in both dyes was detected in response to this precipitation event (Table 8) of 0.69 inches. Likewise, the increased discharge of 28.25 gpm following a 1.13 inch precipitation on December 6, 2014, was accompanied by increases in observed dye concentrations in Little Cricket Spring. • The association between increased discharge and increased solute concentrations was observed, albeit slightly, over the duration of the test. This was observed despite the fact the spring discharge was never greater than 6.5 percent of peak. • Mobilization of sorbed contamination during peak flow fits this conceptual site model. 	

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		<p><i>“Proper Investigative Techniques in Karst,”</i> Indiana Department of Environmental Management Technical Guidance Document, June 30, 2011, provides the following points regarding karst investigations (with emphasis added):</p> <ol style="list-style-type: none"> <i>1. Karst systems can carry suspended solids with attached contamination. When springs are tested, this major contaminant transport mechanism is usually overlooked. Most investigations do not consider the suspended solids in water exiting springs. This can be a major problem when analyzing for contaminants that prefer to stay attached to suspended solids. Metals and PCBs are two examples of contaminants that will stay attached to the particles in the suspended load. When field filtering is conducted on a sample, the suspended soils are removed, and with them a major portion of the contaminant. Field filtering of groundwater or spring water samples in karst areas is not recommended.</i> <i>2. Contaminant concentrations can vary greatly depending on flow rates and rainfall amounts. Unlike granular aquifers, there is an almost immediate response to rainfall in karst aquifers. Most karst aquifers do not usually have a defined plume at a consistent concentration level. For example, a spring may have a normal discharge rate of 20 gallons per minute (gpm) and a contaminant concentration of 2 parts per billion (ppb). However, after a rain fall event the discharge rate may be increased to 200 gpm and the contaminant concentration to 400 ppb.</i> <i>3. Groundwater flow directions may not be apparent and can change direction during storm conditions. During precipitation</i> 	

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		<p><i>events, conduits fill with water and could enter areas that are normally dry. These dry conduits may drain to springs and seeps that do not flow during low flow conditions (these types of springs are called over-flow springs). It is also possible that water could fill up the conduit system enough to cross drainage basin boundaries. Therefore when evaluating karst, both base flow and storm flow conditions need to be studied.</i></p> <p>This tracer study was conducted at base flow, on average less than 1 percent peak discharge that would result from the maximum storm event. Peak flow conditions, which might indicate overflow to other springs, or suspension and transport of colloids, were not encountered during the test.</p> <p>In the discussion of Mass Balance Calculations, the report states,</p> <p><i>“detainment of contaminants of concern has also occurred within the same portion of the epikarstic aquifer and represents the primary source of contaminants that continue to discharge from New Cricket Spring....”</i></p> <p>It would seem the immobile contamination referred to in the report would be most prone to mobilization via colloidal transport at peak discharge. Therefore, sampling of unfiltered samples from Little Cricket Spring during peak flow for dioxins is necessary to establish whether or not dioxin transport is occurring. Likewise, and in accordance with Indiana karst guidance, a dye trace at peak flow versus base flow is advised to evaluate “overflow” conduits or springs.</p>	

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5.	Supplemental Groundwater Tracing Summary Report Section 4 Summary and Conclusions Item 6 Page 25	<p>The report cites Suthersan, et.al. (2014) regarding “mobile porosity” versus “immobile porosity” in its explanation of the unaccounted dye mass. It should be noted the Suthersan paper is based on seepage through porous media, based on uniform radial discharge from an injection well. Immobile porosity refers to “dead end” pore space not connected with the “open” or effective pore space. This concept is key to predicting contaminant seepage velocities versus Darcy fluxes. For this site it is conceptually not an appropriate model, as karst flow is not seepage through porous media, and rarely is it uniformly radial flow from an injection point (usually flow is along preferred fractures and solution cavities in the host limestone). Conclusions should not be drawn from this reference for dye trace conducted at the site. So the contaminant mass, particularly that contaminant mass sorbed to sediment, is not trapped in “dead end” pore space. Rather, it is in non-connected solution cavities that, at peak discharge, may become connected and may discharge colloiddally-transported dioxin at high flows (see points 1 and 3 above).</p>	